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MANUAL OF OPERATION

FOR

MODEL 1100

MODEM TEST SET

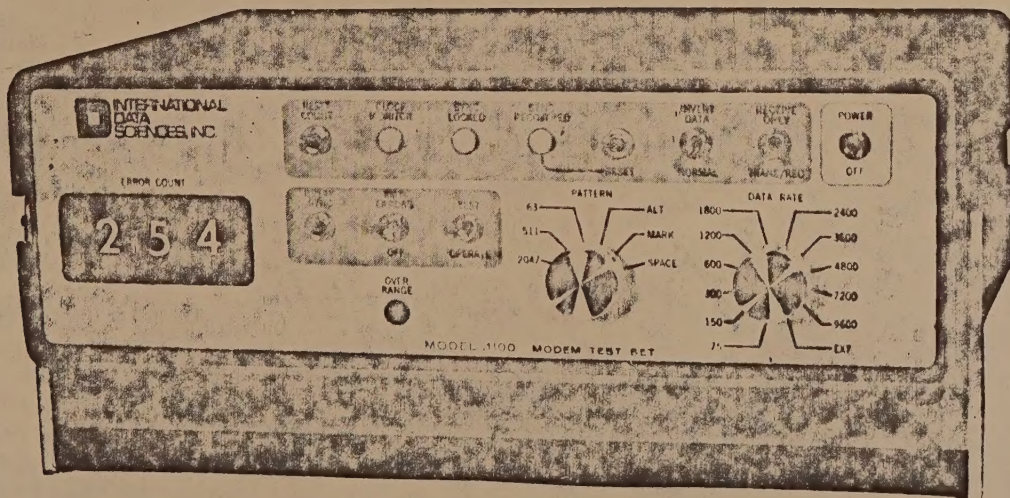


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1.0 INTRODUCTION

The International Data Sciences Model 1100 Modem Test Set is a completely self-contained, portable instrument used to determine the bit error rate, block error rate, and bias distortion of both synchronous and asynchronous data communications systems, multiplexers, and modems.

The test set contains both a data generator (transmitter) and a data analyzer (receiver). In application, a known bit pattern is generated, transmitted through the communication equipment under test, received and then analyzed for bit error rate. The number of bits in error is displayed on direct readout indicators. The test may be employed end-to-end or loop-back since the device has half duplex and full duplex capability.

The Model 1100 generates six patterns, three of which are classed as pseudo-noise sequences required to determine data transmission performance and three of which are levels and level reversals. The variety of test patterns allow compatibility with Western Electric, International Data Sciences, and other transmission test sets that conform to CCITT recommendations.

When externally timed for synchronous applications, the Model 1100 is capable of operating at data rates up to half a megahertz. For asynchronous applications, the timing is internally generated with a high stability crystal-controlled oscillator providing selectable data rates of 75, 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, and 9600 bits per second. Other data rates are optionally available.

Additional features include Invert Data, Transmit (Xmit) Errors, Break Sync, Clock Monitor indicator, Sync Locked indicator and Sync Recovered indicator.

The Invert Data switch may be used to invert the transmitted and received data to compensate for transmission or receiver constraints, to allow link-up with test equipment that utilizes inverted maximal length pseudo-noise sequences, or to determine independency of test results on signal polarity.

The Xmit Errors switch may be used to allow error insertion at the transmitter and observation of that error at the receiver, providing a positive indication that data transfer and performance analysis is occurring.

The Break Sync pushbutton, Sync Locked indicator, and Sync Recovered indicator allow verification of test synchronization. The clock monitor indicator displays the status of the received clock in synchronous operation and the internally generated receiver clock in asynchronous operation.

In addition to the standard RS232 interface for interconnection with the modem, there is an auxilliary connector on the rear panel allowing access to the display count signals, the error pulse signal, transmitter and receiver pattern sync pulses, and others. These signals are made available to facilitate more sophisticated testing and/or test recording. The printer option (IDS' Model 2000 Test Set Printer) plugs into this connector to provide a permanent record copy of test results.

As an option, the Model 1100 may be supplied with a Dual Data Rate selector, a Block Length selector, additional data rates, signal monitoring capability, special logic levels, and a leather carry case. Many other options are listed and described in sections 7.0 and 11.0. The unit is portable, lightweight, and rugged, featuring simple operation while performing sophisticated tests. Both desk-top and rack-mount configurations are available.

2.0 MODEL 1100 OPERATION

Each Model 1100 Modem Test Set is comprised of an independent Data Generator (Transmitter) and Data Analyzer (Receiver) as illustrated in the system block diagram of Figure 1.

The Transmitter portion is capable of generating any of six selectable data patterns or their inverse for use in evaluating the transmission capability of the communication system under test.

If timing is supplied by the modem, the transmitter will generate the selected data at rates of up to half a megahertz (higher data rates are optionally available). For modems that do not supply timing, the data rates internal to the transmitter may be selected by a front panel control (additional data rates are optionally available). The data is buffered to standard EIA levels per RS232 and supplied to a data connector located on the rear panel (MIL 188, DTL/TTL, or other interface levels are optionally available).

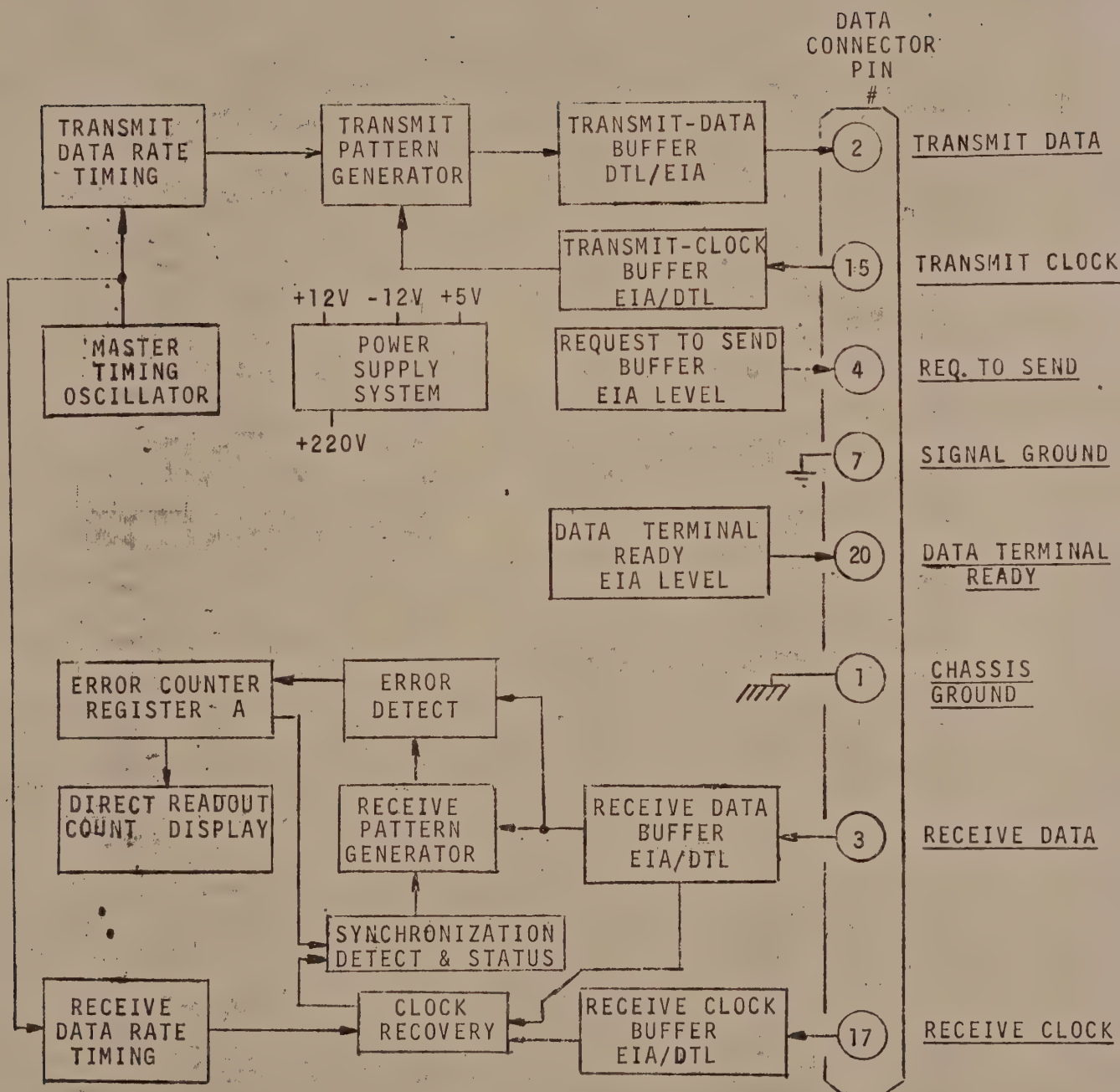


FIGURE 1. MODEL 1100 SYSTEM BLOCK DIAGRAM

The Receiver portion is capable of analyzing the received pseudo-noise data patterns for bit error rate. Data received at the data connector is buffered through EIA double threshold hysteresis circuits before analysis.

To allow bit error rate measurements, the buffered Receive Data signal is synchronized to a locally generated reference sequence and compared bit-by-bit for transmission errors. Bits in error are counted in Register A and displayed by direct readout on the front panel.

3.0. SELF TEST CAPABILITY

The Model 1100 Test Set can be completely and conveniently checked to determine if it is operating correctly by means of two toggle switches and a push-button on the front panel. The Test-Operate switch allows the transmitter to be looped around to the receiver, testing the automatic synchronization, clock recovery, clock monitor, and buffer circuits. The Break Sync pushbutton allows a forced break in synchronization between the transmitter and the receiver testing sync lost detection circuitry, automatic re-synchronization circuitry, and the sync status circuitry. The Xmit Errors switch allows one error per pseudo-noise word to be transmitted testing the error detection and error display circuitry. All of these tests can be performed without disconnecting the test set from the modem. To perform the above tests, the Pattern selector switch must be in either the 2047, 511, or 63 bit pseudo-noise position.

4.0 CONSOLE INDICATORS

The following console indicators are located on the front panel of the Model 1100 Modem Test Set.

4.1 Three Digit Decimal Display

During bit error rate testing, these indicators provide a direct readout of the number of bits in error.

4.2 Overrange

Provides a warning indication when the quantity being displayed by the decimal display has exceeded 999.

4.3 Clock Monitor

Indicates when a clock signal is present at the receiver. When the Data Rate selector switch is in the EXT position the Clock Monitor indicates the presence of a Receive Clock signal. When the Data Rate selector switch is in a selected internal timing position, the Clock Monitor indicates the presence of that internal timing signal.

4.4 Sync Locked

Indicates that the pseudo-noise pattern generated in the receiver is in synchronization with the data signal being received for error rate analysis.

4.5 Sync Recovered

Indicates that the receiver had detected a loss of synchronization during the test, automatically resynchronized, and has started a new test.

5.0 CONSOLE CONTROLS

The following console controls are located on the front panel of the Model 1100 Modem Test Set.

5.1 Reset Count

This pushbutton resets the error counter and the overrange storage.

5.2 Break Sync

This pushbutton causes the receiver to become non-synchronized with the Receive Data signal. Allows self-test of sync loss detection and auto-resynchronization circuitry.

5.3 Invert Data

A toggle switch that allows the inverted data pattern to be transmitted and received. Facilitates link-up with test gear transmitting the inverted maximal length sequence. Also, allows the determination of test results dependency on signal polarity.

5.4 Xmit Errors

A toggle switch that causes the insertion of one error per pseudo-noise sequence to be transmitted. Detection of the error at the receiver provides a positive indication that data transfer and error analysis is occurring.

5.5 Test-Operate

In the Test position, the transmitter data is directed to the receiver input terminal. Self-test of the transmitter and receiver then takes place at a rate determined by the Data Rate selector switch. This mode will allow operation of the Model 1100 independent of external equipment to test its operation. In the Operate position, the Model 1100 is conditioned for the normal operation: communication link, multiplexer or modem testing.

5.6 Receive Only - Trans/Rec

When the toggle switch is in the Receive Only position, the Request to Send signal is off. The Model 1100 is then conditioned to receive data, synchronize, and count errors.

5.7 Data Rate

Bit rate selections of 75, 150, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600 are standard for asynchronous operation; i.e., the timing is not supplied by the modem. Select EXT for synchronous operation; i.e., the timing is supplied by the modem.

5.8 Pattern

Pattern Selections are 2047, 511, and 63 indicating the length of maximal length pseudo-noise sequences; and all Mark, all Space, and Alternate Mark/Space sequence.

5.9 Power On

The power switch energizes and automatically initializes the unit including its counters and sync status circuitry.

5.10 Reset Sync Recovered

A pushbutton which resets the Sync Recovered indicator.

6.0 SPECIFICATIONS AND INTERFACE

6.1 Power

115 or 230 VAC +10%, 50-60Hz. Approximately 35 watts. Details of power strapping changes are given in section 9.0.

6.2 Operating Temperature

0°C to 50°C

6.3 Size

Desktop: Width 12 1/2", Height 4", Depth 8 5/8"

Rackmount: Width 19", Height 4", Depth 8 5/8"

6.4 RS232 Interface

All signals conform to RS232/CCITT V.24 specifications. A Data Connector is mounted on the back panel. Signals are listed in Table 1.

The input signals are Received Data, Transmitter Clock, and Receiver Clock, all required to be low-level and polar, suitable for use with electronic circuitry. In the Test Set, these signals are processed through double threshold hysteresis circuits to allow high noise immunity.

The standard Test Set with RS232 interface has a noise immunity of four volts nominal. The negative threshold is set at minus two volts and the positive threshold is set at plus two volts. Clamping circuitry allows the positive threshold to be exceeded with signals as large as plus 25 volts and the negative threshold to be exceeded with signals as large as minus 25 volts. See Figure 2 and 3 for threshold and interrelationship details.

6.4.1 Transmitter Data

Output Amplitude: +6V = "0" = SPACE
-6V = "1" = MARK

Output Impedance: 600 ohms

6.4.2 Transmitter Clock

Input Amplitude: $\pm 3V$ to $\pm 25V$
Input Impedance: 3000-7000 ohms

6.4.3 Receiver Data

Input Amplitude: $\pm 3V$ to $\pm 25V$
Input Impedance: 3000 to 7000 ohms

6.4.4 Receiver Clock

Input Amplitude: $\pm 3V$ to $\pm 25V$
Input Impedance: 3000 to 7000 ohms

TABLE 1 DATA CONNECTOR

CONNECTOR PIN	CCITT V-24 DESIGNATION	RS232B OR C DESIGNATION	TITLE	DESCRIPTION
				NOTE: "ON" = Positive voltage = Space = Binary 0. "OFF" = Negative voltage = Mark = Binary 1.
1	101	AA	Protective Ground	This lead is an electrical equipment frame and power ground.
2	103	BA	Transmitted Data (TD)	This lead carries the signals that originate in the test set and are to be transmitted by the data modem to a distant station. An output from the test set.
3	104	BB	Received Data (RD)	This lead carries the signals that are generated by the data modem in response to signals from a distant station. An input to the test set.
4	105	CA	Request to Send (RTS)	An "on" condition on this lead indicates that the test set is ready to transmit data. An output from the test set.
5*	106	CB	Clear to Send (CTS)	An "on" condition on the lead indicates that the data modem is ready to transmit data from the test set to a distant terminal. An input to the test set used only with signal monitoring options.
6*	107	CC	Data Set Ready (DSR)	An "on" condition on this lead indicates that the modem is ready to process data. An input to the test set used only with signal monitoring options.
7	102	AB	Signal Ground	This lead established the common ground reference potential for all circuits except protective ground.

CONNECTOR PIN	CCITT V-24 DESIGNATION	RS232B OR C DESIGNATION	TITLE	DESCRIPTION
8*	109	CF	Receive Line Signal (Data Carrier) De- tector (DCB)	This lead provides an indication that data carrier signals from the remote station are being received by the modem. An input to the test set. Used only with Signal Monitoring options.
9-11*				Not used.
12*	122	SCF	Secondary Re- ceive Line Sig- nal (Data Car- rier) Detector (DCD) (s)	This lead provides an indication that data carrier signals from the remote station on the secondary channel are being received by the modem. An input to the test set used only with Signal Monitoring options.
13*	121	SCB	Secondary Clear to Send (CTS)(s)	An "on" condition on this lead indicates that the data modem is ready to transmit data, on the secondary channel, from the test set to a distant terminal. An input to the test set used only when both the Signal Monitoring and Dual Data Rate options are installed.
14*	118	SBA	Secondary Transmitted Data (TD) (s)	This lead carries the signals that originate in the test set and are transmitted by the secondary channel of the data modem to a distant station. An output from the test set used only with the Dual Data Rate option.
15	114	DB	Transmitted Signal Element Timing (TC)	Signals on this line are used to provide the test set with signal element timing information. An input to the test set. Not used when testing asynchronous modems.

CONNECTOR PIN	CCITT V-24 DESIGNATION	RS232B OR C DESIGNATION	TITLE	DESCRIPTION
16*	119	SBB	Secondary Data Received Data (RD) (s)	This lead carries the signals that are generated by the data modem on the secondary channel in response to signals from a distant station. An input to the test set used only with the Dual Data Rate option.
17	115	DD	Receiver Signal Element Timing (RC)	Signals on this line are used to provide the test set with signal element timing information. An input to the test set. Not used when testing asynchronous modems.
18*				Not used
19*	120	SCA	Secondary Request to Send (RTS)(s)	An "on" condition on this lead indicates that the test set is ready to transmit data on the secondary channel. An output from the test set used only with the Signal Monitoring and Dual Data Rate options.
20	108.2	CD	Data Terminal Ready (DTR)	An "on" condition on this lead indicates that the test set is ready to process data. An output from the test set.
21*	110	CG	Signal Quality Detector (SQ)	An "on" condition on this lead indicates that signal quality received by the modem is above a prescribed threshold. An input to the test set used only with the Signal Monitoring options.
22*	125	CE	Ring Indicator	Not used by test set.

CONNECTOR PIN	CCITT V-24 DESIGNATION	RS232B OR C DESIGNATION	TITLE	DESCRIPTION
23*	111/112	CH/CI	Data Signal Rate Selector	Not used by test set.
24*	113	DA	Transmitter Signal Element Timing	Signals on this line are used to provide the transmitting modem with signal element timing information. An output from the test set. Available only as an option.
25*				Not used.

*These leads normally are not included in the cable supplied with the Test Set unless Test Set is equipped with the options specified.

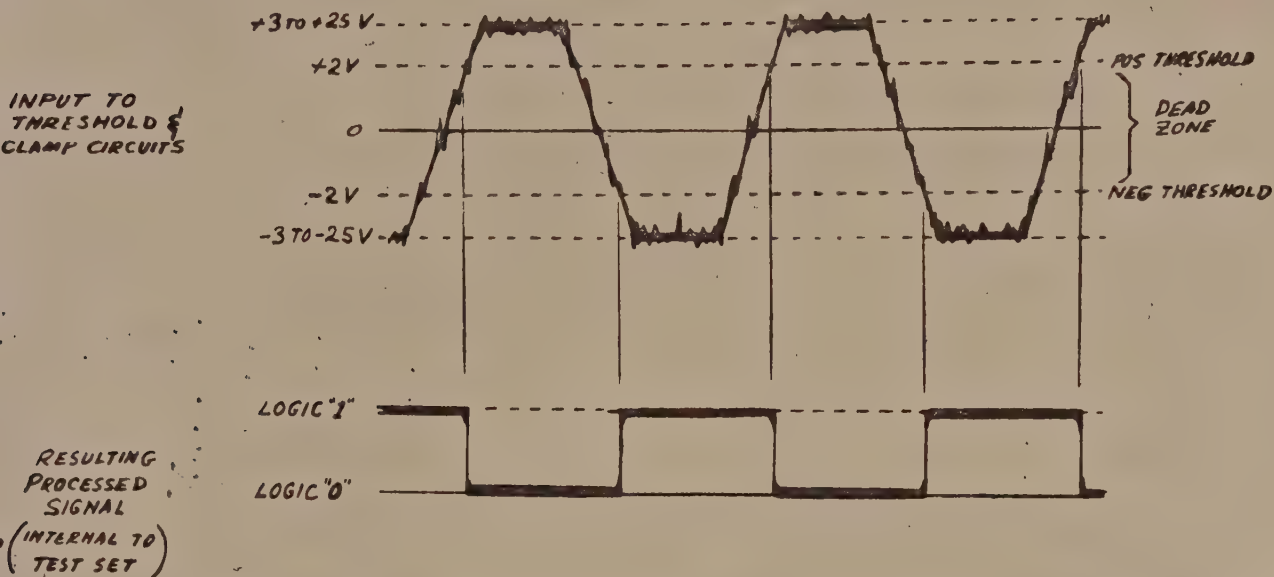
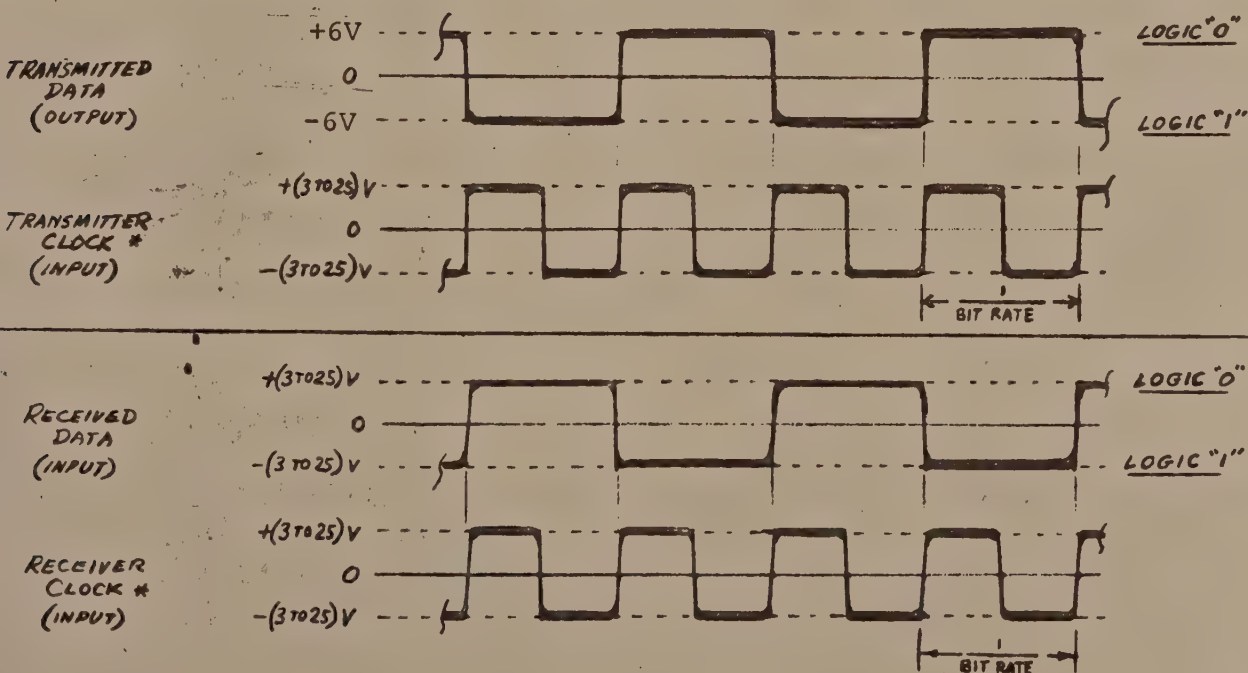


FIGURE 2 PROCESSING OF INPUT SIGNALS



* CLOCK SIGNALS REQUIRED IN SYNCHRONOUS APPLICATIONS ONLY.

FIGURE 3 CLOCK/DATA INTERRELATIONSHIPS

6.5 MIL 188 Interface

The MIL 188C interface (optionally available) has a noise immunity of ± 100 μ A. The thresholds are ± 100 μ A into an impedance of 6K Ω minimum.

6.6 Special Interface

DTL/TTL and special interface levels are also optionally available.

6.7 Printer Output Connector

An additional output connector labeled Option Connector is located on the rear panel to provide signals required for remote monitoring control, data recording, and more detailed test and analysis. The connector is a Cinch-Jones DB25S. Provides compatibility with the Model 2000 Test Set Printer. All important signals are available at this connector. See Table 2.

WARNING! For proper operation of test set, the IDS' Model 2000 Test Set Printer must be turned ON when plugged into the test set option connector.

7.0 OPTIONS

Options are summarized below:

7.1 Carrying Case

A leather carrying case with handle. Space for test set, manual, cords and accessories.

7.2 Rack Mounting

Allows unit to be mounted on a standard rack.

7.3 Dual Data Rate

A double shaft rotary switch allows individual data rates to be selected for the transmitter and receiver sections of the test set. For testing modems with answerback channels.

7.4 Block Length Selector

Block size selected by front-panel rotary switch: Selectable block sizes are 10^3 , 10^4 , 10^5 , 10^6 , 10^7 , 10^8 , bits and 1, 2, 4, 8, 16 and 32 times the word (pattern) length (wl) in bits. A Start Test pushbutton starts the test. A single/Continuous switch allows analysis of either a single block or repeated blocks. A Test End indicator signals the end of a block during the Single Block test mode.

TABLE 2. OPTION CONNECTOR SIGNALS
ALL OUTPUT SIGNALS ARE EITHER +5VOLTS OR 0 VOLTS UNLESS OTHERWISE INDICATED.

PIN	SIGNAL	DESCRIPTION
15	1 Unit	BCD Error Counter Readout (0 volts = "One")
14	2 Units	
12	4 Units	
13	8 Units	
10	1 Ten	
11	2 Tens	
8	4 Tens	
9	8 Tens	
6	1 Hundred	An external negative pulse resets Error Counter and overflow.
7	2 Hundred	
5	4 Hundred	
4	8 Hundred	
17	Reset Error Counter	
24	Receiver in Sync	Signal is 0 volts when receiver is in sync, +5 volts when out of sync.
19	Sync Recovered	Zero level indicates sync has been recovered.
16	Transmitter clock	Data from Modem at transmitter.
22	Receiver clock	Modem clock if synchronous, recovered clock if asynchronous.
1	Start of Trans. Period	Periodic pulse appearing at the beginning of each Pseudo-Random pattern transmitted.
23	Start of Receiver	Periodic pulse appearing in phase with the beginning of each Pseudo-Random pattern received.
3	Clock Monitor	Positive level indicates clock is present at receiver.
2	Error Pulse	A negative pulse appears each time an error is detected.
18	Transmitter Data	Transmitted Pseudo-Random Sequence (± 12 volts.)
20	Received Data	Received Pseudo-Random Sequence (± 12 volts).
21	Signal Ground	
25	Chassis Ground or Sync. Control (Optional)	(Option) Auto Resync disabled if logic "0" (GND), enabled if logic "1" (5v).

7.5 Signal Monitoring

A rotary switch and an indicator lamp allows monitoring of six signals in the EIA interface. They are: Data Set Ready, Receive Carrier Detect, Receive Clock, Clear To Send, Transmit Clock, Signal Quality. In addition, Toggle switches are provided to control the Request to Send and Data Terminal Ready lines. Secondary channel controls are also monitored and controlled if Dual Data Rate option is also installed.

7.6 Signal Monitoring and Display

Eight individual indicators monitor the following signals in the EIA interface. They are: Receive Data, Receive Clock, Transmit Data, Transmit Clock, Clear to Send, Data Set Ready, Data Carrier Detect, Signal Quality. Also, toggle switches are provided to control the Request to Send and Data Terminal Ready lines. Secondary channel controls are also monitored and controlled if Dual Data Rate option is also installed.

7.7 DTL Signal Interface

All input and output signals are modified to conform to standard DTL signal levels.

7.8 MIL 188 Signal Interface

All input and output signals are modified to conform to MIL 188 standards.

7.9 Divide Data Rate

Allows front panel asynchronous data rates to be divided by a fixed factor, allowing transmitting and receiving at normal speeds in addition to those speeds divided by a fixed factor.

7.10 External Timing Adaptor

Allows receiver section to operate at special data rates in the asynchronous mode. An external clock must be provided to a rear panel BNC connector at 48 times the desired input data rate.

7.11 Y-Connector Cable

Allows testing of two simplex or half duplex modems utilizing a single Test Set.

7.12 Additional Data Rates

Data rates other than those shown on Data Rate selector rotary switch are provided.

7.13 Current Interface

Allows testing of Bell 300 type modems having a current mode interface. A Burndy-to-EIA cable is provided. Extra cables available.

7.14 Aluminum Carrying Case

A suitcase-type carrying case with lock; lined with form-fitted, cut sponge.

7.13 3 MHz Operation

This option allows unit to operate synchronously up to 3 Mhz.

8.0 APPLICATION

The following is a step-by-step procedure for operating and self-testing a Range Rider Model 1100 Modem Test Set. Figure 4 describes a typical full-duplex system to be tested. Referring to Figure 4 the system consists of two pieces of business equipment located at terminals A and B, communicating with one another by means of two full-duplex modems and a channel. It is assumed that the modems interface with the business equipment via a standard EIA interface. It can also be assumed that in general the data being transmitted from terminal A to terminal B is completely independent of the data being transmitted in the opposite direction.

8.1 System Test Preparation

The communication system shown in Figure 5 can be tested using two Model 1100 Test Sets. In Figure 5, the business equipment at each terminal has been disconnected and a Test Set substituted. This is accomplished simply by unplugging the EIA standard connectors at the business equipment end and reconnecting to the Model 1100 connector labeled Data. This will allow the cables from the business equipment to the modem to be tested also. If this is inconvenient, the Model 1100 may be connected directly to the modem using the cable supplied with the Test Set.

8.1.1 Error Detection

The receiver section of each Range Rider Model 1100 generates a pure replica of the pseudo-random patterns generated by the transmitter sections. Upon receipt of a pattern from the modulator sections of their respective modems, the receiver sections synchronize the locally generated pattern with the received pattern and commence a bit-by-bit comparison. A counter is incremented by one each time a bit is found to be in error and a digital read-out of the cumulative count is displayed on the front panel. When the error count exceeds 999, the counter resets itself to zero, continues counting and an overflow indication on the front panel is illuminated and remains on until reset manually. The digital error count and the overflow indicator can be reset by utilizing a pushbutton on the front panel labeled Reset Count.

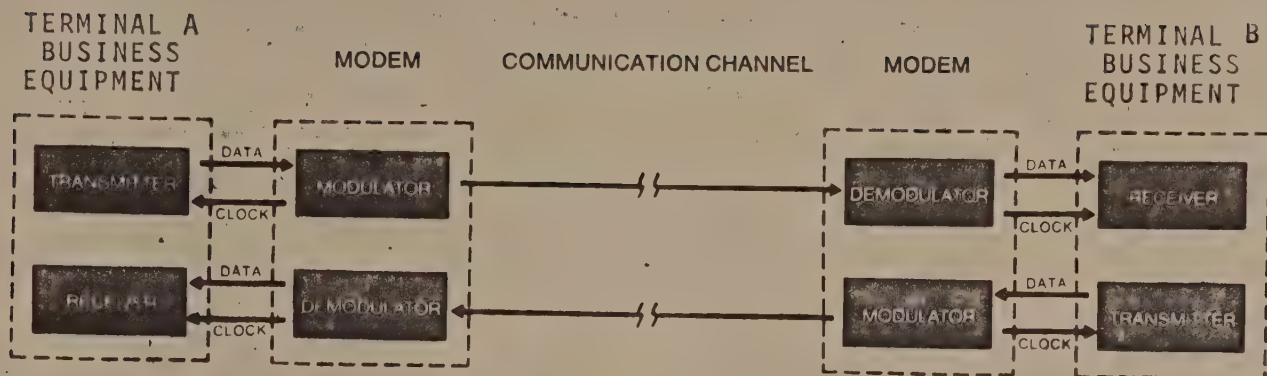


FIGURE 4 Typical Full Duplex Digital Data Communication System

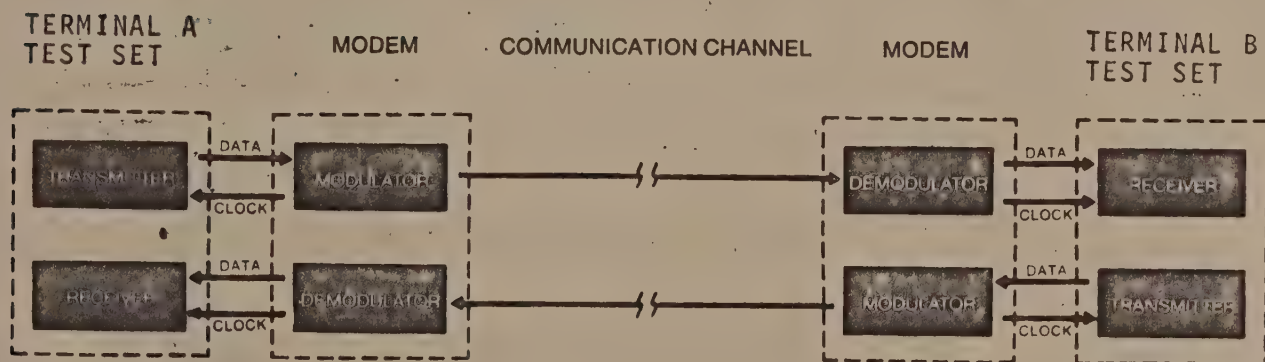


FIGURE 5 Typical Full Duplex Digital Data Communication System Under Test Using Two Test Sets

Thus, bit errors that occur due to modem failures or through natural causes in the communication channel while transmitting data from terminal A to terminal B are detected, recorded, and displayed by the Test Set located at terminal B. The errors occurring during transmission from terminal B to terminal A are detected, recorded, and displayed by the Test Set located at terminal A. The data patterns used in these tests statistically approximate the data patterns generated by the business equipment.

9.0 WIRING MODEL 1100 FOR 115V 60Hz OR 230V 50 Hz

The Model 1100 may be wired to operate from either 115V 60 Hz or 230V 50Hz power input. This modification is normally performed at the factory.

10.0 CALIBRATION PROCEDURE FOR MODEL 1100

MODEM TEST SET

The following describes a procedure for calibrating the Model 1100 Modem Test Set. It is assumed that the test set is not connected to any modem during this procedure.

1. (a) SETTINGS.

Set Power switch to Off. Set Invert Data/Normal switch to Normal. Set Receive Only/Transmit-Receive switch to Transmit-Receive Position. Set Xmit Errors switch to Off. Set Test/Operate switch to Operate. Set Pattern switch to pattern length of 2047 bits. Set Data Rate switch to 2400. Turn Power On.

(b) OBSERVATIONS.

Clock monitor light on. Error count is 000.

2. (a) SETTINGS.

Set Test/Operate switch to Test.

(b) OBSERVATIONS.

Sync locked light goes on. If NIXIES show errors and the Sync Recovered lamp goes on, depress the Sync Recovered Reset pushbutton.

3. (a) SETTING.

Xmit Errors switch to on.

(b) OBSERVATION.

Error count increases at rate of 1 error per pattern length.

4. (a) SETTINGS.

Xmit Errors switch off. Depress and hold Break Sync pushbutton.

(b) OBSERVATION.

Clock Monitor light goes off.

5. (a) SETTING.

Release Break Sync pushbutton.

(b) OBSERVATIONS.

Nixies record large number of errors. Over-range lamp lights. Sync Recovered lamp goes on. Error Count resets to 000.

6. (a) SETTINGS.

Repeat 1a through 5a with Pattern switch set to 511 bit pattern length.

(b) OBSERVATIONS.

Identical to 1b through 5b.

7. (a) SETTINGS.

Repeat paragraphs 1a through 5a with Pattern switch set to 63 bit pattern length.

(b) OBSERVATIONS.

Repeat paragraphs 1b through 5b.

8. (a) SETTINGS.

Repeat 1a through 7a at each Data Rate. (The Ext data rate position will be covered in section 9).

(b) OBSERVATIONS.

Identical to 1b through 7b.

9. (a) SETTINGS.

Set Power switch to OFF. Set Invert Data/Normal Switch to Normal position. Set Receive Only/Transmit-Receive switch to Transmit-Receive position. Set Xmit Errors switch to OFF. Set Test/Operate switch to Operate. Set Pattern switch to pattern length of 2047 bits. Set Data Rate switch to External. Apply 2400 b/s square wave to pin 15 and 17 of data connector. Apply Signal Ground to pin 7 of data connector. The Maximum allowable voltage and current excursions for the input square wave are listed below for each interface circuit.

WARNING. DO NOT EXCEED VALUES LISTED!

EIA: -25V to +25V.

DTL/TTL: 0V to 5V.

MIL 188C: -6V to 6V.

CURRENT: 0MA to 40MA.

The Minimum allowable voltage and current excursions for the input square wave are listed below for each interface circuit.

EIA: -2V to 2V

DTL/TTL: 0V to 1.2V

MIL 188C: +100 μ a to -100 μ a

CURRENT: 5MA to 23MA.

Connect Pin 2 and Pin 3 together on backpanel Data connector. Turn Power switch to ON. Set the Xmit Errors switch to the Xmit Errors position. Vary Amplitude of input square wave over above ranges specified for interface circuits installed in Test Set.

(b) OBSERVATIONS.

Sync Locked light goes on. If NIXIES show errors prior to resetting to 000, the Sync Recovered lamp will go on. Extinguish this lamp by depressing the Sync Recovered Reset pushbutton. Errors are detected at the rate of 1 error per pattern while Xmit Errors switch is in the Xmit Errors position.

11.0 DETAILED OPTION DESCRIPTIONS

11.1 Data Synchronizing Option

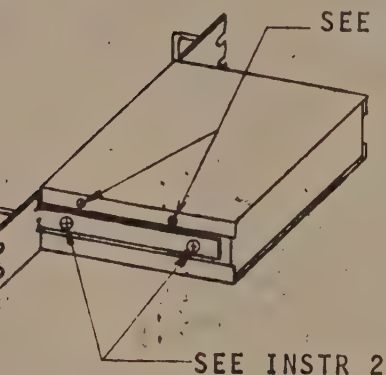
The Model 1100 with Data Synchronizing option allows the receiver section of the Range Rider to operate at asynchronous speeds other than those available by selection on the front panel. A slide switch and four BNC connectors are provided in the back of the unit for this purpose. All interface levels for the BNC connectors are standard DTL/TTL logic. The function of each of the Input signals is described below:

- 11.1.1 DATA IN - This connector allows the input data to drive the receiver portion of the Range Rider.
- 11.1.2 48 x RATE (REF) - This connector allows the external clock to drive the clock recovery system in the Range Rider. The clock does not need to be phased with the data presented at the Data In input but it must be within 2% of the Data In data rate.
- 11.1.3 DATA OUT - The connector allows the output data of the transmitter portion of the Range Rider to drive external equipment. This data is synchronized with the Clock Out output.
- 11.1.4 CLOCK OUT - This connector allows the synchronized output clock to clock the Data Out to external equipment.
- 11.1.5 FRONT PANEL - OTHER

This is a slide switch which when in Front Panel position allows the Model 1100 to operate with its own, front panel selected, data rates. When in Other position, it operates as a data synchronizing terminal at any data rate dictated by the Data In and 48xRate Reference clock.

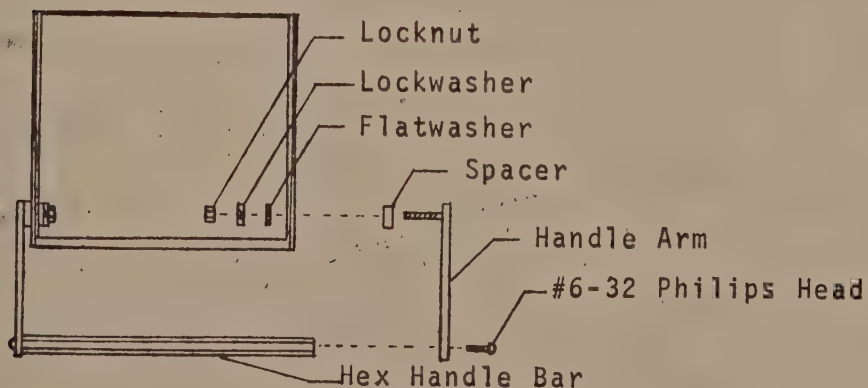
11.2 Rack Mounting Option

Instructions for converting a rack mount to table top model with a handle are given below.



1. Remove top cover by removing two #4-40 philips head screws located on each side of unit.
2. Remove rack mount brackets by removing two #8-32 philips head screws on each bracket.

3. ATTACH HANDLE ASSEMBLY AS FOLLOWS:



- a. At threaded standoff end of handle arm, add one spacer.
- b. Insert this end into chassis.
- c. Fasten flatwasher, lockwasher and locknut to standoff.
Note: Do not tighten locknut completely at this time.
- d. Repeat above for other handle arm.
- e. Locate hex handle bar between arms and fasten with #6-32 philips head screw.
- f. Tighten two locknuts located inside chassis at this time.
Note: Do not over tighten - as handle arm will not move freely.

11.3 Increased Operating Speed Option

The Range Rider Model 1100 Modem Test Set can be optionally conditioned to operate at synchronous data rates of up to three megahertz typical, four megahertz maximum. The signals are made available at the rear panel utilizing four BNC connectors as shown in Figure 7, below.

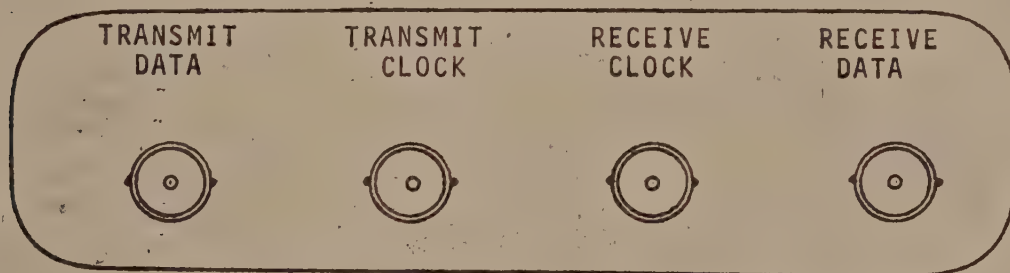


Figure. 7. High frequency signals at rear panel BNC connectors.

Transmit Data is an output signal. Receive Data, Receive Clock, and Transmit Clock are input signals. All signals are DTL/TTL levels, 0 volts to +5 volts nominal. When the BNC inputs and outputs are being used, the EIA connector labeled DATA must be open. When the EIA connector inputs and outputs are being used, the BNC connectors must be open.

11.4 Block Length Selector Option

This option provides the Modem Test Set with a comprehensive block analysis capability. Figure 8 below illustrates the front panel switches and indicators that are provided with this option.

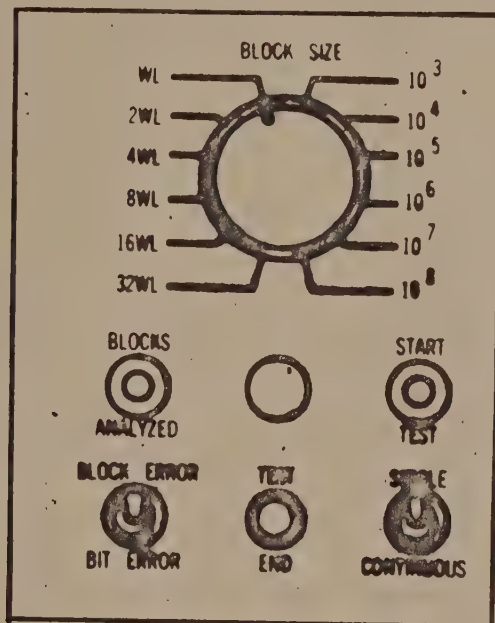


FIGURE 8 BLOCK LENGTH SELECTOR OPTION FRONT PANEL

Block sizes from 10^3 through 10^8 bits in multiple powers of 10 and 1, 2, 4, 8, 16 and 32 times the word (pattern) length (WL) in bits are selectable by a front panel rotary switch labeled Block Size. A Block Error-Bit Error toggle switch determines whether bits in error or blocks in error will be detected, counted and displayed. An internal counter continually tallies the number of blocks analyzed according to the setting of the Block Size rotary switch independent of the Block Error-Bit Error switch position. At any time the total number of blocks analyzed can be displayed simply by depressing a pushbutton labeled Blocks Analyzed.

Blocks of data can be analyzed either one at a time or continuously depending on the position of a toggle switch labeled Single-Continuous. In the Single position, a single block of data, its size selected by the Block Size rotary switch, is analyzed for errors on a bit-by-bit basis. The operator starts the test by depressing a Start-Test pushbutton and the test automatically ends when the block of data has been completely analyzed for errors. An End Test lamp lights to indicate this fact to the operator

and the total number of errors in that block is displayed by the nixie display. Thus, the operator can determine the bit error rate directly by reading the nixie display and the setting of the Block Size rotary switch. The test can be repeated simply by again depressing the Start Test pushbutton.

The block error rate can be determined directly by selecting the block size through the Block Size rotary switch, setting the Single-Continuous switch to Continuous and the Block Error-Bit Error switch to Block Error. The nixies will display the running total of blocks in error while the internal block counter will tally the total number of blocks analyzed. This latter total can be displayed at any time by depressing the Blocks Analyzed pushbutton. The analysis is halted while this pushbutton is depressed and continued when it is released.

The following controls and indicators are associated with this option.

11.4.1 Block Size

Data Block sizes from 10^3 through 10^8 bits in multiple powers of 10 and 1, 2, 4, 8, 16 and 32 times the word (pattern) length (WL) in bits are selectable for analysis by this 8-position rotary switch.

11.4.2 Single-Continuous

Blocks of data can be analyzed either one at a time or continuously depending on the position of this switch. In the Single position, a single block of data, its size determined by the setting of the Block Size rotary switch, is analyzed for errors on a bit-by-bit basis. The analysis starts when the Start Test pushbutton is depressed and ends when the block of data has been completely analyzed.

When this switch is in the Continuous position, data is continually analyzed either bit-by-bit or block-by-block depending on the setting of the Block Error-Bit Error switch.

11.4.3 Start Test

This pushbutton is active only when the Single-Continuous switch is in the Single position. Depressing this pushbutton starts the analysis of a single block of data on a bit-by-bit basis.

11.4.4 Test End

Indicates when the analysis of a single block of data has been completed. This lamp operates only when the Single-Continuous switch is in the Single position.

- 1 → Trans. req.
- 2 → transmitted data
- 3 → Pending data
- 4 → Request to send
- 5 → Trans. req. sent
- 6 → Data not ready
- 7 → Signal on
- 8 → Data carrier sense
- 9 → Positive DC test volt
- 10 → negative " " "
- 11 → unassigned
- 12 → See, Data carrier detect
- 13 → See, Data carrier detect
- 14 → See, transmitted data
- 15 → Transmitter clock
- 16 → See, pending data
- 17 → Receiver clock
- 18 → Receiver D-bit clock
- 19 → See, Request to send
- 20 → Data Terminal Ready
- 21 → Signal quality indicator
- 22 → Ring indicator
- 23 → Data Rate Select
- 24 → EOT Transmitter clock
- 25 → Trans.

11.5 DTL/TTL Interface Option

The DTL/TTL Interface option allows the test set to operate with DTL/TTL signals. All input and output signals are standard zero to five volt levels. A 15 pin connector Data (B) located at the rear of the unit (See Fig. 9) is utilized for this interface.

The input/output signals are described in Table 3.

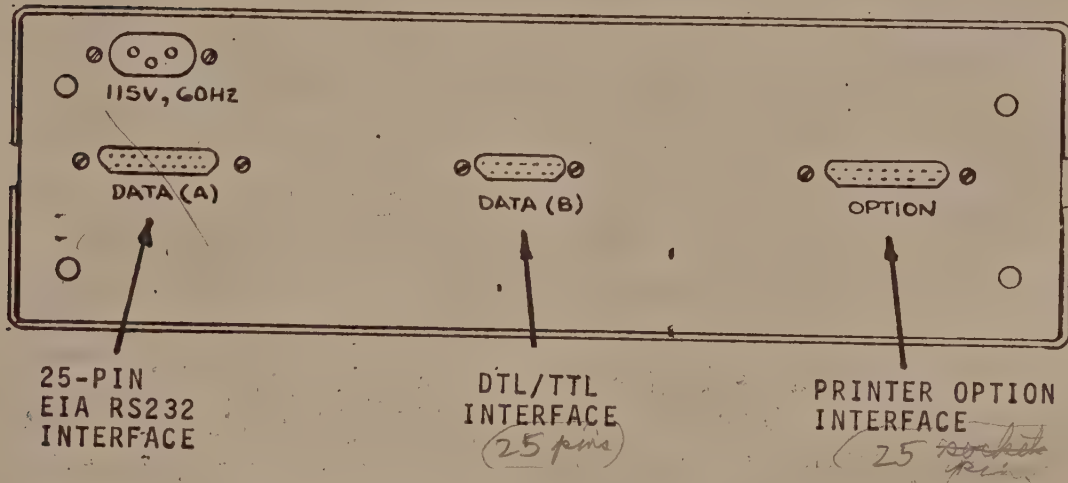


Figure 9. Back Panel Arrangement For DTL/TTL Interface Option

TABLE 3

DATA B CONNECTOR PIN ASSIGNMENTS

PIN	CODE	NAME	DESCRIPTION
1	ORN	Frame Ground	Frame Ground
2	BLU	Transmit Data	An Output; 0 volts = MARK, +5 volts = SPACE.
3	YEL	Received Data	An Input; 0 volts = MARK, +5 volts = SPACE
4	RED	Request to Send	An Output; 0 volts = OFF, +5 volts = ON.
5	BLK	Receive Clock	An Input; 0 to 5 volts square wave. Required for synchronous testing.
6	BRN	Transmit Clock	An Input; 0 to +5 volts square wave. Required for synchronous testing.
7	GRN	Signal Return	0 volts reference.
8	WHT	Data Terminal Ready	An Output; 0 volts = OFF, +5 volts = ON.
9-15	---	(Not Used)	---

CALIBRATION AND REPAIR SERVICE

All units sold by International Data Sciences, Inc. are calibrated at the time of delivery. International Data Sciences, Inc. recommends a periodic calibration every six months thereafter performed by the Calibration Department at International Data Sciences, Inc. The cost of this service is \$25 for each calibration. If the unit requires repairs that are not covered by the original warranty, then IDS will perform the repair at a charge of \$12 per hour plus parts. Normal turn-around time for calibration is two weeks.

Equipment so calibrated will bear a gummed label, illustrated below, on the rear panel.

 INTERNATIONAL DATA SCIENCES, INC.		100 NASHUA ST. PROVIDENCE, R.I. 401-274-5100.	
INSTRUMENT CALIBRATION LABORATORY			
SER NO.	903XXX	●	Serial Number of unit calibrated
CAL DATE	1/1/73	●	Date calibrated
CAL DUE	6/1/73	●	Recommended next calibration date
CAL BY	# 7	●	In-plant calibrator identifier

SAMPLE

All units returned to IDS for calibration will be accepted only if transportation charges are prepaid. The purchaser is also responsible for all transportation charges incurred in returning the calibrated unit to the purchaser.

For fast service DAX, Mark IV or Emery Air Freight are recommended. If time is not a problem, UPS is recommended. Return address should be clearly stated and should include a person to the attention of whom unit will be shipped.

Shipping cartons with proper foam packing are available from IDS at a price of \$10 each. The carton will facilitate shipping the equipment to be calibrated with a maximum of protection.

WARRANTY

All International Data Sciences, Inc. instruments are warranted against defects in material, workmanship and component failures for a period of ninety days and against defects in material and workmanship for a period of one year. All units returned to IDS under this warranty require prepaid transportation charges. The purchaser is also responsible for all transportation charges incurred in returning the repaired unit to the purchaser.

Instruments to be returned under this Warranty require prior authorization by an International Data Sciences, Inc. representative or by the service manager of International Data Sciences, Inc.

International Data Sciences, Inc. reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This Warranty is expressly in lieu of all other obligations or liabilities on the part of International Data Sciences, Inc., and International Data Sciences, Inc. neither assumes nor authorizes any person to assume for them any other liability in connection with the sales of International Data Sciences, Inc. instruments.



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